



COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
PERMIT
TO WITHDRAW GROUNDWATER
(FOR USE IN GROUNDWATER MANAGEMENT AREAS)

Permit Number: GW0002001
Effective Date: March 02, 2014
Expiration Date: March 01, 2024

Pursuant to Section 62.1-256 of the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia) and the Ground Water Withdrawal Regulation (9 VAC 25-610-10 et seq.), the STATE WATER CONTROL BOARD hereby authorizes

Permittee Aqua Virginia, Inc.
Address 2414 Granite Ridge Road
Rockville, Virginia 23146
Facility Woodruff Public Water System

to withdraw and use groundwater in accordance with this permit and the application received February 4, 2010 and subsequently amended.

The permittee is authorized to withdraw 4,634,000 gallons per year.

The permittee shall comply with all requirements contained on this cover page, Part I - Permit Standards, Limitations, and Conditions, Part II - Special Conditions, the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia), and the Ground Water Withdrawal Regulation (9 VAC 25-610-10 et seq.). Nothing in this permit or this regulation shall be construed to relieve the permittee of the duty to comply with all applicable Federal and State statutes and regulations.

The permitted withdrawal will be used to supply potable water to homes that lie within the service area of the Woodruff Public Water System in accordance with the usage patterns identified in the groundwater permit application. Other beneficial uses are not authorized by this permit.

Any non-compliance with permit conditions, the Ground Water Withdrawal Regulation 9 VAC 25-610-10 et seq. or the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia) is a violation of the regulation and law, and is grounds for enforcement action, permit termination, revocation, amendment, or denial of a permit renewal application.

By direction of the STATE WATER CONTROL BOARD, this Permit is granted by:

Signed 
For the STATE WATER CONTROL BOARD

Date 2/21/14

Part I
Permit Standards, Limitations and Conditions

1. The withdrawal of groundwater shall originate from the following withdrawal point(s):

<u>Owner Well Name/#</u>	<u>DEQ Well#</u>	<u>Depth</u>	<u>Aquifer</u>	<u>Latitude</u>	<u>Longitude</u>
Woodruff PW #I	150-144	416	Middle Potomac.	37°49'19.30"	77°08'37.03"
Woodruff PW #IA	150-180	398	Middle Potomac	37°49'20.23"	77°08'37.75"

2. Withdrawals from the well or well system are limited as follows:
 In a calendar month: Total pumpage from these wells shall not exceed 626,000 gallons.
 The permittee shall report any exceedance of this monthly withdrawal limit by fifth (5th) working day of the month following the month of exceedance.
3. Water use from each well and total system water use shall be recorded monthly and reported on forms provided by the Department of Environmental Quality (Department or DEQ) to the Groundwater Withdrawal Permitting Program by the tenth day of each January, April, July and October for the respective previous standard quarter. Records of water use shall be maintained by the permittee as required in Section 9 VAC 25-610-130 (F).
4. Permitted users shall install in-line totalizing flow meters to read gallons, cubic feet or cubic meters on each permitted well prior to beginning the permitted use. Meters shall be tested in accordance with American Water Works Association (AWWA) Manual M-6, "Water Meters - Selection, Installation, Testing, and Maintenance". Such meters shall produce volume determinations within plus or minus 10% of actual flows. A defective meter or other device must be repaired or replaced within 30 days. A defective meter is not grounds for not reporting withdrawals. During any period when a meter is defective generally accepted engineering methods shall be used to estimate withdrawals and the period during which the meter was defective must be clearly identified in groundwater withdrawal reports.
5. Each permitted well shall be equipped in a manner such that water levels can be measured during pumping and nonpumping periods without dismantling any equipment. Any opening for tape measurement of water levels shall have an inside diameter of 0.5 inches and be sealed by a removable plug or cap. The permittee shall provide a tap for taking raw water samples from each permitted well.
6. The permittee shall not place a pump or water intake device lower than the top of the uppermost confined aquifer that a well utilizes as a groundwater source or lower than the bottom of an unconfined aquifer that a well utilizes as a groundwater source.
7. Each well that is included in this groundwater withdrawal permit shall have affixed to the well casing, in a prominent place, a permanent well identification plate that records the Department of Environmental Quality well identification number, the groundwater withdrawal permit number, the total depth of the well and the screened intervals in the well, at a minimum. Such well identification plates shall be in a format specified by the Department and are available from the Department.

8. The Water Conservation and Management Plan (Plan) as described in the application received February 4, 2010 and subsequently amended is incorporated into this permit and included as Attachment A. Requirements in the Plan shall have the same effect as any condition contained in this permit and may be enforced as such. Records of activities conducted pursuant to the Plan shall be submitted to the Department upon request.
9. This permit may be reopened for the purpose of amending the conditions of the permit to meet new regulatory standards duly adopted by the Board.
10. A new permit application must be submitted two hundred seventy (270) days before the expiration date of this permit.
11. A new permit application must be submitted two hundred seventy (270) days prior to any proposed modification to this permit which will result in an increase of withdrawal above permitted limits or violate the terms and conditions of this permit.
12. This permit may be reopened for amendment, transfer, or revocation as described in Part 6 of the Ground Water Withdrawal Regulation (9 VAC 25-610-290 through 9 VAC 25-610-30).
13. The permittee must notify the Department in writing and obtain staff approval of any change in the status, construction or pump setting of wells included in this permit. A revised GW-2 form must be submitted to the Department within 30 days in the event that the physical construction of a well is altered or the pump setting in the well is changed.
14. The permittee must notify the Department in writing of any change of contact person, address, or phone number that is contained in the application received February 4, 2010 and subsequently amended.
15. Upon presentation of credentials the Board or Department, or any duly authorized agent, shall have the power to enter, at reasonable times and under reasonable circumstances, any establishment or upon any property, public or private, located anywhere in the Commonwealth for the purposes of obtaining information, conducting surveys or inspections, or inspecting wells and springs to ensure compliance with any permits, standards, policies, rules, regulations, rulings and special orders which the Board or Department may adopt, issue or establish to carry out the provisions of the Ground Water Management Act of 1992 and the Ground Water Withdrawal Regulation.

Part II Special Conditions

1. This permit includes withdrawals from two wells and one of the wells was previously controlled by Permit No. GW0002000.
2. This permit allows daily withdrawals consistent with the requirements and conditions of the Virginia Department of Health Waterworks Operation Permit (WWOP) #4101950. The permittee shall submit copies of WWOP and associated Engineering Description Sheets to DEQ within 30 days of an upgrade.
3. Within five years of the effective date of the permit, the permittee shall submit a Water Conservation and Management Plan Status Report to the Department of Environmental Quality, Groundwater Withdrawal Permitting Program. The report shall include discussions as to the status (updates, successes and failures, future plans, etc.,) for the various objectives incorporated in the Plan (Attachment A of this permit, Section 13.3 through 13.11) and make suggestions for changes as necessary to ensure water use rates are reduced or being maximized.

4. The existing pump settings in the individual wells are as follows:

<u>Owner Well Name/#</u>	<u>DEQ Well#</u>	<u>Existing Pump Setting</u> <u>in ft. (bgl)</u>
Woodruff PW #1	150-144	126
Woodruff PW #1A	150-180	147

Any change in the depth of pump settings in the well shall be submitted to the Department for approval as described in Part I, Condition 13 of the permit

5. The maximum pump setting depth in the wells is restricted as follows:

<u>Owner Well Name/#</u>	<u>DEQ Well#</u>	<u>Existing Pump Setting</u> <u>in ft. (bgl)</u>
Woodruff PW #1	150-144	300
Woodruff PW #1A	150-180	300

The permittee shall not place a pump or water intake device lower than the above maximum pump depths in these wells as explained in Part I, Condition 6 of the permit. The maximum pump settings may be adjusted if the basis used for estimating the depth of the top of the Middle Potomac Aquifer was incorrect. A minor amendment to this permit may be made to reflect the change.

6. A minor amendment to this permit must be made to include additional wells. Additional wells may be permitted under a minor amendment if the total withdrawal does not exceed the permitted amount contained in this permit, the withdrawal from all additional wells originates from the Middle Potomac Aquifer, and the location of the wells is approved by DEQ staff prior to construction. Additionally, a complete suite of geophysical logs (Spontaneous Potential, Single Point Resistance, 16/64 Short and Long Normal, Natural Gamma) shall be submitted to the DEQ Richmond Office prior to setting the pump intake. All geophysical logs and well completion reports shall be referenced by the DEQ well number.

7. This permit may be reopened, if the issuance of groundwater withdrawal permits required by the Ground Water Management Act of 1992 for existing permitted users indicates that the basis used for predicting compliance with regulatory drawdown criteria was inaccurate.

ATTACHMENT A
Water Conservation & Management Plan

WATER CONSERVATION & MANAGEMENT PLAN
APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT

WOODRUFF PUBLIC WATER SYSTEM

Aqua Virginia, Inc
2414 Granite Ridge Road
Rockville, Virginia 23146



~~February 2010~~

Revised

March 12, 2013

13.0 REGULATORY REQUIREMENTS In 1992, Virginia adopted the Groundwater Management Act (Title 62.1, Chapter 25, code of Virginia, 1950, as amended) regulating groundwater withdrawals in critical aquifer use areas. The Eastern Virginia and the Eastern Shore Groundwater Management Areas were established at that time due to a decline in groundwater levels of up to 200 feet in some places due to excessive groundwater use. In these management areas, a groundwater withdrawal permit is required for any application to initiate a new withdrawal or expand an existing withdrawal in the groundwater management area. As part of the Ground Water Withdrawal Permit (GWWP) application, a Water Conservation and Management Plan (WCMP) must be submitted with the GWWP application and becomes an enforceable part of the GWWP permit. In accordance with 9VAC25-610-100, a WCMP must include at a minimum the following items.

- The use of water saving plumbing and processes including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code;
- A water loss reduction program;
- A water use education program;
- An evaluation of potential water reuse options; and
- Requirements for mandatory water use restrictions during water shortage emergencies declared by the local governing body.

13.1 THE NEED FOR WATER CONSERVATION

Water conservation is a focused effort by a water user to reduce the use of water. This effort can minimize development of new resources and reduce the cost of future water service. Each gallon of water that is not used through conservation is one less that needs to be stored, treated, pumped and distributed. The reduction in the use of water may also result in energy savings if the water needs to be heated for washing or bathing or pass through a wastewater treatment system before it is returned to the environment.

Water conservation has reached a new level of awareness. Conservation may represent a practical alternative to developing and increasing the water supply or at least complement new water supply development projects until technologies evolve to meet the needs of an ever growing population. Clean water supplies, like other natural resources, are a limited resource, which must be managed carefully so that they are preserved for future generations. Efforts to conserve existing supplies and the efficient allocation of water resources need to be made at each stage of the water supply planning process.

13.2 CONSERVATION MEASURES AND MANAGEMENT STRATEGIES

Aqua Virginia, Inc owns and operates the Woodruff public water system which services the Woodruff subdivision in King William County. The subdivision is located on West River Road (State Route 600) approximately miles northwest of Aylett. The water system services 56 residential and one commercial connection utilizing two active wells (Woodruff Well 1 and Woodruff Well 1A). The wells are located in the Woodruff subdivision on the northeast end of Honeysuckle Lane on a dedicated well lot. Water storage includes one 12,000-gallon gravity storage tank and a 5,000-gallon hydropneumatic tank located at the well site.

Based on Virginia's *Waterworks Regulations* (12VAC5-590-690), the average water consumption rate on an annual basis is 100 gallons per day (gpd) per person per dwelling. According to the 2000 Census statistics, there are 2.7 persons per household in King William County, so the annual average water consumption rate of each home is estimated to be 270 gpd. The actual water consumption based on the average system withdrawal data between 2008 and 2012 is 192 gpd per connection.

13.3 OBJECTIVES

The objective of the Water Conservation and Management Plan is to develop a documented, effective conservation and management strategy that is designed to minimize the demand for groundwater and comply with 9VAC25-610. The plan consists of operational programs and strategies that will be used every day in the management and maintenance of the water and wastewater utility. The specific conservation and management strategies are presented in the following sections.

Generally, these management tools are listed here in descending order from normal to the most extreme of water conservation measures.

13.3.1 Water Saving Plumbing and Processes

Building codes directly specify the use of water conservation fixtures, such as conservation type flushometer valves in new toilets. These codes apply to all new construction and some remodeling of existing structures. Homeowners will be provided with education literature as part of customer education program about using more efficient water conserving fixtures when replacing old fixtures. Besides reducing the volume of water used for a particular activity, the customer can also reduce their water bill independent of normal usage habits.

Where applicable, water saving plumbing and processes will also be used within the water system. As equipment is replaced within the water system, water saving alternatives will be evaluated. Water treatment and filtration systems, flushing activities and plumbing upgrades are areas where water savings can be realized and addressed. System improvements will be

assessed regularly as new technology become available that will allow water savings, along with providing system operators with continuing education on maintaining the water system and improving water system efficiencies.

Although the major benefit of low flow plumbing fixtures is a reduction in the unnecessary use of potable water, it also has the benefit of reducing the downstream wastewater requiring treatment.

13.4 Water Loss Reduction Program

13.4.1 Unaccounted for Water Analysis

Unaccounted for water analysis and review of water production is the primary means of managing water usage on the system.

The water distribution will be tested for leaks using the comparison of residential water meters and the well meters; thus an unaccounted for water analysis will show any major leaks or discrepancies. Additionally, weekly and monthly reviews of water use data through operational logs, data entry, and reports will be tabulated to identify possible leaks. As of March, 2007, the customers meters are read every other month. The current billing system is being modified and upgraded to supply unaccounted for water analysis automatically. However, the current process is manual. Currently, this analysis will occur not less than once annually to establish the system base line for error within metering equipment. For systems like Woodruff, the best information and most timely information as to high usage events are the operating data the waterworks operators collect from reading the well meters and totalizing water use each week. Subtle trends and seasonality in water use data must be accounted for based on historical trends. Eventually, all the system water meters may be upgraded to radio read with the ability to bill monthly. This will depend on available capital. When this upgrade occurs, billing will be more frequent, as will unaccounted for water analysis. Customer leak detection analysis will be more frequent.

The water use on the system will be reviewed at each pump house visit, on each monthly operators report, the quarterly usage report, and annually on unaccounted for water analysis. More frequent reviews may be possible as new technologies are implemented within the meter reading systems.

13.4.2 Water System Leak Detection and Repair

If a leak on the system occurs it will be repaired as soon as possible, typically within 24 hours. If the usage data or unaccounted for water analysis indicates a water leak which cannot be visually located, the system will be searched for leaks. Additionally, exceptionally high usage at customer's meters shall also be reviewed from billing department data.

The location of leaks in the distribution system and the success of a repair program depend on the following factors:

- Pipe age and material;
- System operating pressures;
- Soil Type;
- Soil pH; and
- Pipeline depth.

Generally, the initial searches for leaks include walking the system lines and looking for puddles or wet areas that could hint of a leak. For subsurface leaks not identified on the surface, electronic equipment will be employed using sophisticated listening equipment and computer analysis. These sonic leak-detection equipment methods are used to identify the sound of water escaping from a pipe. The devices can include listening devices that make contact with valves and hydrants, and geophones that listen directly on the ground. In addition, simultaneous monitoring at multiple points can assist in pinpointing the exact location of a leak.

Employees shall inspect all pump station piping for leaks during each visit and employees shall notify management of any leaks observed in the pump station or on the distribution system in a timely manner.

The entire distribution system will be visually inspected on each meter reading cycle by walking, observation while driving the system and reviewing the meter locations and searching for apparent leaks. Upon notification that a leak exists in the pump station or on the distribution system, the leak(s) shall be repaired in a timely manner.

Upon bill generation for customer bills, high usage bills will be reviewed carefully and may be re-read to verify the usage and look for customer leaks. Customers are responsible for home plumbing leaks and water use may be discontinued by the utility until repairs are made if sufficient water is being wasted, the customer is not responsive, or the home is abandoned.

13.4.3 Customer Leak Detection and Repair

Employees shall observe customers piping which exists in and adjacent to the Company's facilities during meter reading for leaks on the customers plumbing. Employees shall make note of any leaks observed and report the leaks to the Billing Department. The Billing Department shall notify the customer in a timely manner that a leak has been observed on their plumbing.

The Billing Department will also notify a customer in a timely manner if abnormally high usage is indicated on the account which could indicate a possible leak. Customers will also be notified of

specific leak detection methods available at Aqua's Water Smart website (<https://www.aquaamerica.com/water-smart/conservation/detecting-leaks.aspx>).

13.5 Water Use Reduction through Customer Education

Educational information regarding the advised use of plumbing fixtures which are deemed as "water saving" per the Uniform Statewide Building Code and regarding the importance of conserving water shall be distributed to each customer.

Information on water saving practices as well as educational information regarding the investigation/detection of leaks shall be sent to each customer annually. Educational information will be included addressing the advantages of water saving devices, where water savings devices may be utilized, outdoor irrigation tips identifying the best management practices for irrigation and information on new water saving devices and water use practices as the information becomes available. Best management practices may include information on drought tolerant and low water use plantings, efficient irrigation, mulching, limiting turf areas and re-using water where applicable. Water conservation through public awareness, particularly education of outdoor water use during dry conditions will benefit from the information. Establishing conservation practices by residents through education is likely to modify long term water use patterns. Customers will also be notified of specific water saving practices available at Aqua's Water Smart website (<https://www.aquaamerica.com/water-smart/conservation.aspx>), which provides links to additional online water conservation information which is updated periodically.

A comprehensive public awareness and education program is essential to an effective conservation program. Significant amounts of time and money can go into developing a good program, but without public education on water conservation issues, well-planned programs will not reach their intended audiences. The goal of a conservation awareness program is to make the customer understand their water sources, the costs of supplying the water to the customer, the problems associated with supplying water, and how changes in consumer behavior can lower the cost of supplying water and lower water cost to the customer.

13.6 Water Use Reduction through Billing Incentives

Water billing can be used as a means to disseminate conservation information to water users and to provide incentives to customers to use water efficiently. The current rate structure strategy is to bill customers a base rate for zero gallons and then bill for every gallon used, usually rounded to the nearest thousand gallons. What this does is lower the rates on low water users and increase rates on higher water users. Water use goals are established by estimating indoor and outdoor water use throughout the year. The water use estimates can be based on typical water use of similar dwellings within the subdivision. The indoor usage generally remains constant

year-round while the outdoor use increases during the late spring, summer and early fall months. Each user's water consumption for each billing cycle is included on the bill. Should water usage increase to a level which could cause an overage of the permitted withdrawal, the utility could notify customers with the highest usages of their water use relative to a reasonable usage rate. The goals are based on the particular characteristics of each customer, although reasonable usage rates can be recommended based on the particular characteristics of the customer's dwelling. Consumers can benefit from a goal-billing program because they will become aware of their own water use patterns. As a result, they will have an opportunity to reduce their unnecessary water use. The customers who will be negatively impacted are those who will not modify their water use to meet goals. This program is probably best targeted for residential users because their total water use is easily identified and reasonable goals can be developed. One difficulty is determining an acceptable means for segregating indoor from outdoor use. It would be more difficult to determine goals for commercial and industrial users because their water use varies with the type of processes employed.

The water system rates are regulated by the State Corporation Commission (SCC) in a document called the "tariff" or the "Rates, Rules, and Regulations" which upon approval are part of Virginia Law. Changing rates normally takes from 120 days to over one year to process. The ability to modify rates is dependent on SCC. The customers are billed at a flat rate, which was increased in 2012 from \$0.0054/gallon to \$0.00704/gallon. The impacts of the increased rate on water use habits is likely to be felt over several billing cycles. Aqua may modify the rate structure if it deems that changing the rates will improve water conservation practices.

In a severe case of water conservation measures, the SCC tariff could be modified to have a stepped increase in rates over certain usage amounts. This tiered rate structure would increase the per gallon cost of water over certain limits. For example different rates for 0-8,000 gallons, 8,000 to 16,000, and over 16,000 gallons. Thus, this rate structure could cause customers to change their water use behavior due to the increase in the tiered rate while allowing normal use at prevailing rates. The tiered rate structure shall be evaluated based on water use trends during the permit period. If water use projections are observed for the water system that may exceed the permitted amount, the tiered rate structure may be used to reduce excessive water use.

13.7 Pressure Reduction

Pressure reduction is an extreme form of reducing customer water usage. Reducing pressure decreases the amount of water lost through leaking pipes, faucets and water heaters and also decreases the water used without changing customer usage habits.

Reduced system pressures can result in decreased water use and lower operating costs due to reduced pumping requirements. However, the applicability of this measure is limited by state requirements regarding minimum system pressures, the need to provide adequate flow capability in a system, and the constraints of existing facilities such as the elevation of homes.

13.8 Water Reuse Options

No wastewater treatment system is located on site and no wastewater is available for water reuse. Residential wastewater is treated by onsite septic and drain-field systems. Water reuse options will be assessed if new reuse options become available. Water reuse by consumers will be addressed as part of the Public Education program.

13.9 Mandatory Water Use Reductions

The water utility is responsible for establishing water use limits and developing the restrictions that will be necessary to maintain an adequate supply of water. These programs are not well accepted by the public and often incite a negative view of the water utility. However, the programs may be the only effective means of reducing demand under extreme conditions. For these reasons, water rationing and mandatory use restrictions are only implemented under the most extreme conditions. The public expects, and prudent water supply management planning dictates that these provisions be reserved for extreme, unexpected situations and not for planning the supply necessary to meet normal needs.

In the event a water shortage and an emergency is declared by the local governing body or the director of DEQ, mandatory water use restrictions that prohibit all non-essential uses will be implemented.

13.10 Emergency Use Procedures

Use restrictions are conservation measures that are employed to produce short-term water demand reductions during water supply emergencies. These are instituted to create immediate reductions in water usage and carry either a long-term or a short-term cost to customers. When restrictions are removed, habits formed tend to linger for a time and, to some extent, can have a lasting impact on water use.

Use restrictions must be clearly differentiated from normal conservation programs. While use restrictions are considered a form of conservation because they result in demand reductions, they are addressed separately from normal conservation because they are only implemented during periods when the water supply is threatened. As a result, the savings associated with the implementation of use restrictions should not be incorporated into the planning of future water supplies. Rather, such restrictions are reserved as contingency measures for emergency

situations (e.g., drought) and are more severe than those used to determine the long-term water supply deficit.

Use restrictions are commonly implemented using the following tiered approach. Tier 1 is activated during the initial stages of a water shortage. Voluntary use restrictions are encouraged by the water utility, but compliance is not required.

When water supplies become further stressed, Tier 2 restrictions are implemented. At this tier level, mandatory use restrictions are implemented according to local ordinances. Restrictions are enforced and penalties for violations are incurred. Finally, Tier 3 is implemented only under the most serious water shortages and employs water rationing.

The conditions that warrant implementation of each tier are normally related to specific storage levels in the raw water system. Once the tier levels are developed, an ordinance would be required to define use limits and to specify enforcement of the restrictions.

The following types of use restrictions are examples that could be employed during each of the three tiers to ensure an adequate level of protection during water shortages.

13.10.1 Tier 1 - Voluntary Use restrictions

Voluntary use restrictions are employed as a first stage in reducing water demands during a potential water shortage. These constraints are designed to limit water use for a potential water shortage. These constraints limit nonessential water uses, such as outdoor water uses, (e.g., car washing and lawn watering).

There are several different measures that can be used to minimize outdoor water use. Odd-even watering is a common water use restriction. This measure requires that only those homes with even-numbered street addresses may irrigate their lawn on even-numbered calendar days, while the same rationale applies to odd-numbered addresses. Another alternative is to limit the hours during the day that irrigation is allowed, such as early morning or late evening hours when less water is lost. Time restrictions may be placed on other outdoor water uses as well, such as car washing.

The restriction of water use through voluntary action has been widely employed. Most localities that have established conservation programs encourage reduced water use during peak demand periods and when supply levels begin to fall.

Tier 1 restrictions are likely to be accepted by only that portion of the public that understands the purpose and necessity of the restrictions. Therefore, a well-planned public education program must accompany implementation of Tier 1 use restrictions.

13.10.2 Tier 2 - Mandatory Use Restrictions

When implementation of Tier 1 does not reduce demands efficiently and water availability declines further, mandatory restrictions are put into effect. Mandatory use restriction programs would include the same measures that are encouraged under Tier 1. The difference is that in Tier 2, compliance is mandated by an ordinance and the restrictions are enforced with penalties.

Tier 2 restrictions would go into effect when declared by the local governing body and determines that the severity of the situation warrants mandatory restrictions. During a Tier 2 situation, outdoor water use may be restricted or banned as the water supply becomes further threatened. If a particular user has consistently violated the use restrictions, the utility may discontinue service. With an efficient public education program, the public can be encouraged to report violations of the regulations. This practice helps to enforce the regulations and achieve the program goals.

Limiting the number of new hookups to the system is an alternative form of mandatory restrictions used when growth is threatening the reliability of existing water supplies. Under severe drought conditions, the utility may be unable to provide efficient service to additional customers. In these cases, the utility prohibits the connection of new construction to the system until additional water supply is available. A drought emergency is not always a prerequisite for implementing these use restrictions. If normal demands threaten to exhaust available supplies prior to the development of new or expansion of existing supplies, a moratorium on new connections may be put into effect.

Many water departments across the Country employ outdoor water codes, both voluntary and mandatory. During the Virginia drought of 1980 through 1981, the City of Virginia Beach, Virginia implemented a strong water use reduction program which included mandatory use restrictions. The first step to the program consisted of mandatory restrictions that banned the use of nonessential uses of water. Nonessential uses were defined to include the following:

- Watering of shrubbery, trees, lawns, grass, plants, or other vegetation, except from a watering can or other container not exceeded three gallons in capacity.
- Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in facilities operating with a water recycling system approved by the City, or except from a bucket or other container not exceeding three gallons in capacity; provided, further, that any facility operating with an approved water recycling system must prominently display, in public view, a sign stating that such a recycling system is in operation.
- Washing of sidewalks, streets, driveways, parking areas, service station aprons, exteriors of homes, apartments, commercial or industrial buildings or any other outdoor surface, except from a bucket or other container not exceeding three (3) gallons in capacity.

- The operation of any ornamental fountain or other structure making a similar use of water.
- The filling of swimming or wading pools or the refilling of swimming or wading pools which were drained after the effective date of the order.
- The use of water from fire hydrants for any purpose other than necessary governmental operations.
- The serving of drinking water in restaurants, cafeterias, or any other establishments, unless requested to do so by the individual being serviced.

These restrictions limit the use of water to only necessary uses during an emergency.

These restrictions are brought into effect when the locality is suffering from a water supply emergency and the restrictions are printed in any newspaper or general circulation in the County, or broadcast upon any radio or television station serving the area. Included in the restrictions is the prohibition of flushing new water mains at construction sites. Flushing is required following construction to remove debris from the lines before potable water can be delivered. This measure effectively places a moratorium on new water hookups in newly constructed subdivisions.

Mandatory use restrictions implemented during Tier 2, such as those enforced in Virginia Beach during the 1980-1981 drought, are not usually favored by the general public because they restrict public actions. However, if strong enforcement and public education programs accompany implementation, greater compliance could be achieved.

13.10.3 *Tier 3 - Water Rationing*

Under severe drought conditions, under authority by DEQ or other governmental bodies, water rationing can be used as a method to further reduce water usage. With water rationing, the local water utility specifies a per capita amount of water that is allowed for use at the current billing rate. If this amount is exceeded, a surcharge is issued for water used above the allotted amount. This method is implemented if voluntary and mandatory restrictions are unable to reduce demands sufficiently or if water availability declines further.

The surcharge applied to water use above the allotment is significant. Because the surcharge is very high, it is a strong deterrent against exceeding the allotment value. Again, a strong public education program is required along with implementation of water rationing.

Water rationing is an unpopular alternative for both localities and consumers. It places extreme restrictions on consumer water use and provides a very strong negative incentive for maintaining water usage below the allotted level. The program is not likely to be supported by the consumer

because of the high fees incurred for exceeding water limits. However, the program is usually successful at reducing demands if ordinances are in place to enforce the goals.

13.11 Outdoor Water Use Conservation Measures

Landscape irrigation and outdoor water uses are responsible for the increased water use trends in the summer months. The average water use during the winter months is equivalent to 156 gpd/ERC while the average summer water use is equivalent to 231 gpd/ERC. The water system serves up-market subdivisions that typically have large landscaped lots, and a significant proportion of residences have in-ground irrigation systems.

To support the beneficial needs of the communities while conserving water, the water conservation measures described in the previous sections, including water saving devices, water loss reduction, conservation through customer education, billing schedule incentives, and water restriction measures may help minimize water use for irrigation and other outdoor uses.

Modifying the outdoor water use habits of the residents are most likely modified through education. Aqua's approach to educating customers shall include the following:

- Provide information to the home owners associations for inclusion in flyers provided to the residents;
- Provide water conversation tips and information on best irrigation practices to be included with the customers' bills annually.

The customers shall be provided with information specific to managing residential irrigation systems and swimming pools, including the following water saving tips provided by Aqua's water-smart website (<https://www.aquaamerica.com/water-smart/conservation.aspx>):

- Water your lawn only when it needs it. Simply walk across the grass to see if it needs water. If you leave footprints, it's time to water.
- Water in the early morning. Nearly 30 percent of water can evaporate when watering at midday. Don't water your lawn on windy days.
- Deep soak your lawn instead of frequent sprinklings that evaporate quickly.
- Set your lawn mower one notch higher to limit evaporation.
- Check sprinkler heads and valves for leaks and adjust the timer according to seasonal water needs and weather conditions.
- Plant for your climate. Native and drought-tolerant plants might have lower water needs. A local nursery can help you plan a water-wise garden.
- Use mulch around plants and shrubs to save moisture.
- When using a hose, control the flow with an automatic shut-off nozzle.
- Use a broom, instead of a hose, to clean sidewalks and driveways.
- When washing your car, use soap and water from a bucket, along with a sponge and hose with a shut-off valve.

- Disconnect hoses and make sure outdoor water is shut off during cold weather to prevent leaks.
- If you have a swimming pool, get a cover. You'll cut the loss of water by evaporation by 90 percent.
- Eliminate shrub bed irrigation for established landscaping.
- Maintain automated irrigation systems controls to limit overwatering.
- Repair significant leaks quickly to minimize the loss of water.

Educational materials shall also include information on water saving devices suitable for irrigation systems, including:

- Converting the irrigation system controllers to weather based controllers, including rain sensors; and
- Replacement of irrigation heads with more efficient types that will reduce runoff.

As discussed in Section 13.6, the impacts from increasing water rates may have an effect on water conservation in these subdivisions. Billing rate changes were implemented in 2012. The water rates were increased from \$0.0054/gallon to \$0.00704/gallon, and billed at a flat base rate for every gallon used. The effectiveness of the rate increase on reducing water use are likely to be felt over time, and any changes attributed to the recent rate increases will be monitored.

Modifying water use habits without significant water rate increases is not expected. If water use projections are observed for the water system that may exceed the permitted amount, a tiered rate structure may be used to reduce excessive water use. As the water system rates are regulated by the Virginia SCC, modifying the rates in a timely manner is unlikely. In addition, the impacts of a tiered rate structure on water use are not known. Alternatively, voluntary use restrictions may be employed to limit water use. Voluntary constraints may limit nonessential water uses, such as outdoor water uses, (e.g., car washing and lawn watering). Acceptance of voluntary restrictions would be improved through conservation education described above. Voluntary conservation methods could include odd-even watering, limiting the hours during the day that irrigation is allowed, or time restrictions placed on outdoor irrigation.



COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Quarter 1 2 3 4
Page ___ of ___

Quarterly Ground Water Withdrawal Report

Name of Facility **Woodruff Public
Water System**
Owner **Aqua Virginia, Inc.**
Address **2414 Granite Ridge Rd.
Rockville, VA 23146**
County/City **King William County**

Name of Operator _____
Position/Title _____
Signature _____
Date _____ Phone _____
Permit #GW0002001
(New Permit Application Due – June 5, 2023)

Month of _____ 19____

Owner Well Number	DEQ Well Number	Present Reading	Previous Reading	Flow Multiplier	Total Gallons
Well #1 374919077083601	150-144				
Well #1A 374920077083702	150-180				
Total Gallons (this month)					

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I CERTIFY THAT UNDER PENALTY OF LAW THAT REQUIRES THIS DOCUMENT AND ALL INFORMATION SUBMITTED WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. TO THE BEST OF MY KNOWLEDGE THE INFORMATION SUBMITTED IS ACCURATE AND COMPLETE.

NAME: _____ DATE: _____

SIGNATURE: _____

ATTACHMENT A
Water Conservation & Management Plan

WATER CONSERVATION & MANAGEMENT PLAN
APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT

WOODRUFF PUBLIC WATER SYSTEM

Aqua Virginia, Inc
2414 Granite Ridge Road
Rockville, Virginia 23146



~~February 2010~~

Revised

March 12, 2013

13.0 REGULATORY REQUIREMENTSIn 1992, Virginia adopted the Groundwater Management Act (Title 62.1, Chapter 25, code of Virginia, 1950, as amended) regulating groundwater withdrawals in critical aquifer use areas. The Eastern Virginia and the Eastern Shore Groundwater Management Areas were established at that time due to a decline in groundwater levels of up to 200 feet in some places due to excessive groundwater use. In these management areas, a groundwater withdrawal permit is required for any application to initiate a new withdrawal or expand an existing withdrawal in the groundwater management area. As part of the Ground Water Withdrawal Permit (GWWP) application, a Water Conservation and Management Plan (WCMP) must be submitted with the GWWP application and becomes an enforceable part of the GWWP permit. In accordance with 9VAC25-610-100, a WCMP must include at a minimum the following items.

- The use of water saving plumbing and processes including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code;
- A water loss reduction program;
- A water use education program;
- An evaluation of potential water reuse options; and
- Requirements for mandatory water use restrictions during water shortage emergencies declared by the local governing body.

13.1 THE NEED FOR WATER CONSERVATION

Water conservation is a focused effort by a water user to reduce the use of water. This effort can minimize development of new resources and reduce the cost of future water service. Each gallon of water that is not used through conservation is one less that needs to be stored, treated, pumped and distributed. The reduction in the use of water may also result in energy savings if the water needs to be heated for washing or bathing or pass through a wastewater treatment system before it is returned to the environment.

Water conservation has reached a new level of awareness. Conservation may represent a practical alternative to developing and increasing the water supply or at least complement new water supply development projects until technologies evolve to meet the needs of an ever growing population. Clean water supplies, like other natural resources, are a limited resource, which must be managed carefully so that they are preserved for future generations. Efforts to conserve existing supplies and the efficient allocation of water resources need to be made at each stage of the water supply planning process.

13.2 CONSERVATION MEASURES AND MANAGEMENT STRATEGIES

Aqua Virginia, Inc owns and operates the Woodruff public water system which services the Woodruff subdivision in King William County. The subdivision is located on West River Road (State Route 600) approximately miles northwest of Aylett. The water system services 56 residential and one commercial connection utilizing two active wells (Woodruff Well 1 and Woodruff Well 1A). The wells are located in the Woodruff subdivision on the northeast end of Honeysuckle Lane on a dedicated well lot. Water storage includes one 12,000-gallon gravity storage tank and a 5,000-gallon hydropneumatic tank located at the well site.

Based on Virginia's *Waterworks Regulations* (12VAC5-590-690), the average water consumption rate on an annual basis is 100 gallons per day (gpd) per person per dwelling. According to the 2000 Census statistics, there are 2.7 persons per household in King William County, so the annual average water consumption rate of each home is estimated to be 270 gpd. The actual water consumption based on the average system withdrawal data between 2008 and 2012 is 192 gpd per connection.

13.3 OBJECTIVES

The objective of the Water Conservation and Management Plan is to develop a documented, effective conservation and management strategy that is designed to minimize the demand for groundwater and comply with 9VAC25-610. The plan consists of operational programs and strategies that will be used every day in the management and maintenance of the water and wastewater utility. The specific conservation and management strategies are presented in the following sections.

Generally, these management tools are listed here in descending order from normal to the most extreme of water conservation measures.

13.3.1 Water Saving Plumbing and Processes

Building codes directly specify the use of water conservation fixtures, such as conservation type flushometer valves in new toilets. These codes apply to all new construction and some remodeling of existing structures. Homeowners will be provided with education literature as part of customer education program about using more efficient water conserving fixtures when replacing old fixtures. Besides reducing the volume of water used for a particular activity, the customer can also reduce their water bill independent of normal usage habits.

Where applicable, water saving plumbing and processes will also be used within the water system. As equipment is replaced within the water system, water saving alternatives will be evaluated. Water treatment and filtration systems, flushing activities and plumbing upgrades are areas where water savings can be realized and addressed. System improvements will be

assessed regularly as new technology become available that will allow water savings, along with providing system operators with continuing education on maintaining the water system and improving water system efficiencies.

Although the major benefit of low flow plumbing fixtures is a reduction in the unnecessary use of potable water, it also has the benefit of reducing the downstream wastewater requiring treatment.

13.4 Water Loss Reduction Program

13.4.1 Unaccounted for Water Analysis

Unaccounted for water analysis and review of water production is the primary means of managing water usage on the system.

The water distribution will be tested for leaks using the comparison of residential water meters and the well meters; thus an unaccounted for water analysis will show any major leaks or discrepancies. Additionally, weekly and monthly reviews of water use data through operational logs, data entry, and reports will be tabulated to identify possible leaks. As of March, 2007, the customers meters are read every other month. The current billing system is being modified and upgraded to supply unaccounted for water analysis automatically. However, the current process is manual. Currently, this analysis will occur not less than once annually to establish the system base line for error within metering equipment. For systems like Woodruff, the best information and most timely information as to high usage events are the operating data the waterworks operators collect from reading the well meters and totalizing water use each week. Subtle trends and seasonality in water use data must be accounted for based on historical trends. Eventually, all the system water meters may be upgraded to radio read with the ability to bill monthly. This will depend on available capital. When this upgrade occurs, billing will be more frequent, as will unaccounted for water analysis. Customer leak detection analysis will be more frequent.

The water use on the system will be reviewed at each pump house visit, on each monthly operators report, the quarterly usage report, and annually on unaccounted for water analysis. More frequent reviews may be possible as new technologies are implemented within the meter reading systems.

13.4.2 Water System Leak Detection and Repair

If a leak on the system occurs it will be repaired as soon as possible, typically within 24 hours. If the usage data or unaccounted for water analysis indicates a water leak which cannot be visually located, the system will be searched for leaks. Additionally, exceptionally high usage at customer's meters shall also be reviewed from billing department data.

The location of leaks in the distribution system and the success of a repair program depend on the following factors:

- Pipe age and material;
- System operating pressures;
- Soil Type;
- Soil pH; and
- Pipeline depth.

Generally, the initial searches for leaks include walking the system lines and looking for puddles or wet areas that could hint of a leak. For subsurface leaks not identified on the surface, electronic equipment will be employed using sophisticated listening equipment and computer analysis. These sonic leak-detection equipment methods are used to identify the sound of water escaping from a pipe. The devices can include listening devices that make contact with valves and hydrants, and geophones that listen directly on the ground. In addition, simultaneous monitoring at multiple points can assist in pinpointing the exact location of a leak.

Employees shall inspect all pump station piping for leaks during each visit and employees shall notify management of any leaks observed in the pump station or on the distribution system in a timely manner.

The entire distribution system will be visually inspected on each meter reading cycle by walking, observation while driving the system and reviewing the meter locations and searching for apparent leaks. Upon notification that a leak exists in the pump station or on the distribution system, the leak(s) shall be repaired in a timely manner.

Upon bill generation for customer bills, high usage bills will be reviewed carefully and may be re-read to verify the usage and look for customer leaks. Customers are responsible for home plumbing leaks and water use may be discontinued by the utility until repairs are made if sufficient water is being wasted, the customer is not responsive, or the home is abandoned.

13.4.3 Customer Leak Detection and Repair

Employees shall observe customers piping which exists in and adjacent to the Company's facilities during meter reading for leaks on the customers plumbing. Employees shall make note of any leaks observed and report the leaks to the Billing Department. The Billing Department shall notify the customer in a timely manner that a leak has been observed on their plumbing.

The Billing Department will also notify a customer in a timely manner if abnormally high usage is indicated on the account which could indicate a possible leak. Customers will also be notified of

specific leak detection methods available at Aqua's Water Smart website (<https://www.aquaamerica.com/water-smart/conservation/detecting-leaks.aspx>).

13.5 Water Use Reduction through Customer Education

Educational information regarding the advised use of plumbing fixtures which are deemed as "water saving" per the Uniform Statewide Building Code and regarding the importance of conserving water shall be distributed to each customer.

Information on water saving practices as well as educational information regarding the investigation/detection of leaks shall be sent to each customer annually. Educational information will be included addressing the advantages of water saving devices, where water savings devices may be utilized, outdoor irrigation tips identifying the best management practices for irrigation and information on new water saving devices and water use practices as the information becomes available. Best management practices may include information on drought tolerant and low water use plantings, efficient irrigation, mulching, limiting turf areas and re-using water where applicable. Water conservation through public awareness, particularly education of outdoor water use during dry conditions will benefit from the information. Establishing conservation practices by residents through education is likely to modify long term water use patterns. Customers will also be notified of specific water saving practices available at Aqua's Water Smart website (<https://www.aquaamerica.com/water-smart/conservation.aspx>), which provides links to additional online water conservation information which is updated periodically.

A comprehensive public awareness and education program is essential to an effective conservation program. Significant amounts of time and money can go into developing a good program, but without public education on water conservation issues, well-planned programs will not reach their intended audiences. The goal of a conservation awareness program is to make the customer understand their water sources, the costs of supplying the water to the customer, the problems associated with supplying water, and how changes in consumer behavior can lower the cost of supplying water and lower water cost to the customer.

13.6 Water Use Reduction through Billing Incentives

Water billing can be used as a means to disseminate conservation information to water users and to provide incentives to customers to use water efficiently. The current rate structure strategy is to bill customers a base rate for zero gallons and then bill for every gallon used, usually rounded to the nearest thousand gallons. What this does is lower the rates on low water users and increase rates on higher water users. Water use goals are established by estimating indoor and outdoor water use throughout the year. The water use estimates can be based on typical water use of similar dwellings within the subdivision. The indoor usage generally remains constant

year-round while the outdoor use increases during the late spring, summer and early fall months. Each user's water consumption for each billing cycle is included on the bill. Should water usage increase to a level which could cause an overage of the permitted withdrawal, the utility could notify customers with the highest usages of their water use relative to a reasonable usage rate. The goals are based on the particular characteristics of each customer, although reasonable usage rates can be recommended based on the particular characteristics of the customer's dwelling. Consumers can benefit from a goal-billing program because they will become aware of their own water use patterns. As a result, they will have an opportunity to reduce their unnecessary water use. The customers who will be negatively impacted are those who will not modify their water use to meet goals. This program is probably best targeted for residential users because their total water use is easily identified and reasonable goals can be developed. One difficulty is determining an acceptable means for segregating indoor from outdoor use. It would be more difficult to determine goals for commercial and industrial users because their water use varies with the type of processes employed.

The water system rates are regulated by the State Corporation Commission (SCC) in a document called the "tariff" or the "Rates, Rules, and Regulations" which upon approval are part of Virginia Law. Changing rates normally takes from 120 days to over one year to process. The ability to modify rates is dependent on SCC. The customers are billed at a flat rate, which was increased in 2012 from \$0.0054/gallon to \$0.00704/gallon. The impacts of the increased rate on water use habits is likely to be felt over several billing cycles. Aqua may modify the rate structure if it deems that changing the rates will improve water conservation practices.

In a severe case of water conservation measures, the SCC tariff could be modified to have a stepped increase in rates over certain usage amounts. This tiered rate structure would increase the per gallon cost of water over certain limits. For example different rates for 0-8,000 gallons, 8,000 to 16,000, and over 16,000 gallons. Thus, this rate structure could cause customers to change their water use behavior due to the increase in the tiered rate while allowing normal use at prevailing rates. The tiered rate structure shall be evaluated based on water use trends during the permit period. If water use projections are observed for the water system that may exceed the permitted amount, the tiered rate structure may be used to reduce excessive water use.

13.7 Pressure Reduction

Pressure reduction is an extreme form of reducing customer water usage. Reducing pressure decreases the amount of water lost through leaking pipes, faucets and water heaters and also decreases the water used without changing customer usage habits.

Reduced system pressures can result in decreased water use and lower operating costs due to reduced pumping requirements. However, the applicability of this measure is limited by state requirements regarding minimum system pressures, the need to provide adequate flow capability in a system, and the constraints of existing facilities such as the elevation of homes.

13.8 Water Reuse Options

No wastewater treatment system is located on site and no wastewater is available for water reuse. Residential wastewater is treated by onsite septic and drain-field systems. Water reuse options will be assessed if new reuse options become available. Water reuse by consumers will be addressed as part of the Public Education program.

13.9 Mandatory Water Use Reductions

The water utility is responsible for establishing water use limits and developing the restrictions that will be necessary to maintain an adequate supply of water. These programs are not well accepted by the public and often incite a negative view of the water utility. However, the programs may be the only effective means of reducing demand under extreme conditions. For these reasons, water rationing and mandatory use restrictions are only implemented under the most extreme conditions. The public expects, and prudent water supply management planning dictates that these provisions be reserved for extreme, unexpected situations and not for planning the supply necessary to meet normal needs.

In the event a water shortage and an emergency is declared by the local governing body or the director of DEQ, mandatory water use restrictions that prohibit all non-essential uses will be implemented.

13.10 Emergency Use Procedures

Use restrictions are conservation measures that are employed to produce short-term water demand reductions during water supply emergencies. These are instituted to create immediate reductions in water usage and carry either a long-term or a short-term cost to customers. When restrictions are removed, habits formed tend to linger for a time and, to some extent, can have a lasting impact on water use.

Use restrictions must be clearly differentiated from normal conservation programs. While use restrictions are considered a form of conservation because they result in demand reductions, they are addressed separately from normal conservation because they are only implemented during periods when the water supply is threatened. As a result, the savings associated with the implementation of use restrictions should not be incorporated into the planning of future water supplies. Rather, such restrictions are reserved as contingency measures for emergency

situations (e.g., drought) and are more severe than those used to determine the long-term water supply deficit.

Use restrictions are commonly implemented using the following tiered approach. Tier 1 is activated during the initial stages of a water shortage. Voluntary use restrictions are encouraged by the water utility, but compliance is not required.

When water supplies become further stressed, Tier 2 restrictions are implemented. At this tier level, mandatory use restrictions are implemented according to local ordinances. Restrictions are enforced and penalties for violations are incurred. Finally, Tier 3 is implemented only under the most serious water shortages and employs water rationing.

The conditions that warrant implementation of each tier are normally related to specific storage levels in the raw water system. Once the tier levels are developed, an ordinance would be required to define use limits and to specify enforcement of the restrictions.

The following types of use restrictions are examples that could be employed during each of the three tiers to ensure an adequate level of protection during water shortages.

13.10.1 Tier 1 - Voluntary Use restrictions

Voluntary use restrictions are employed as a first stage in reducing water demands during a potential water shortage. These constraints are designed to limit water use for a potential water shortage. These constraints limit nonessential water uses, such as outdoor water uses, (e.g., car washing and lawn watering).

There are several different measures that can be used to minimize outdoor water use. Odd-even watering is a common water use restriction. This measure requires that only those homes with even-numbered street addresses may irrigate their lawn on even-numbered calendar days, while the same rationale applies to odd-numbered addresses. Another alternative is to limit the hours during the day that irrigation is allowed, such as early morning or late evening hours when less water is lost. Time restrictions may be placed on other outdoor water uses as well, such as car washing.

The restriction of water use through voluntary action has been widely employed. Most localities that have established conservation programs encourage reduced water use during peak demand periods and when supply levels begin to fall.

Tier 1 restrictions are likely to be accepted by only that portion of the public that understands the purpose and necessity of the restrictions. Therefore, a well-planned public education program must accompany implementation of Tier 1 use restrictions.

13.10.2 Tier 2 - Mandatory Use Restrictions

When implementation of Tier 1 does not reduce demands efficiently and water availability declines further, mandatory restrictions are put into effect. Mandatory use restriction programs would include the same measures that are encouraged under Tier 1. The difference is that in Tier 2, compliance is mandated by an ordinance and the restrictions are enforced with penalties.

Tier 2 restrictions would go into effect when declared by the local governing body and determines that the severity of the situation warrants mandatory restrictions. During a Tier 2 situation, outdoor water use may be restricted or banned as the water supply becomes further threatened. If a particular user has consistently violated the use restrictions, the utility may discontinue service. With an efficient public education program, the public can be encouraged to report violations of the regulations. This practice helps to enforce the regulations and achieve the program goals.

Limiting the number of new hookups to the system is an alternative form of mandatory restrictions used when growth is threatening the reliability of existing water supplies. Under severe drought conditions, the utility may be unable to provide efficient service to additional customers. In these cases, the utility prohibits the connection of new construction to the system until additional water supply is available. A drought emergency is not always a prerequisite for implementing these use restrictions. If normal demands threaten to exhaust available supplies prior to the development of new or expansion of existing supplies, a moratorium on new connections may be put into effect.

Many water departments across the Country employ outdoor water codes, both voluntary and mandatory. During the Virginia drought of 1980 through 1981, the City of Virginia Beach, Virginia implemented a strong water use reduction program which included mandatory use restrictions. The first step to the program consisted of mandatory restrictions that banned the use of nonessential uses of water. Nonessential uses were defined to include the following:

- Watering of shrubbery, trees, lawns, grass, plants, or other vegetation, except from a watering can or other container not exceeded three gallons in capacity.
- Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in facilities operating with a water recycling system approved by the City, or except from a bucket or other container not exceeding three gallons in capacity; provided, further, that any facility operating with an approved water recycling system must prominently display, in public view, a sign stating that such a recycling system is in operation.
- Washing of sidewalks, streets, driveways, parking areas, service station aprons, exteriors of homes, apartments, commercial or industrial buildings or any other outdoor surface, except from a bucket or other container not exceeding three (3) gallons in capacity.

- The operation of any ornamental fountain or other structure making a similar use of water.
- The filling of swimming or wading pools or the refilling of swimming or wading pools which were drained after the effective date of the order.
- The use of water from fire hydrants for any purpose other than necessary governmental operations.
- The serving of drinking water in restaurants, cafeterias, or any other establishments, unless requested to do so by the individual being serviced.

These restrictions limit the use of water to only necessary uses during an emergency.

These restrictions are brought into effect when the locality is suffering from a water supply emergency and the restrictions are printed in any newspaper or general circulation in the County, or broadcast upon any radio or television station serving the area. Included in the restrictions is the prohibition of flushing new water mains at construction sites. Flushing is required following construction to remove debris from the lines before potable water can be delivered. This measure effectively places a moratorium on new water hookups in newly constructed subdivisions.

Mandatory use restrictions implemented during Tier 2, such as those enforced in Virginia Beach during the 1980-1981 drought, are not usually favored by the general public because they restrict public actions. However, if strong enforcement and public education programs accompany implementation, greater compliance could be achieved.

13.10.3 Tier 3 - Water Rationing

Under severe drought conditions, under authority by DEQ or other governmental bodies, water rationing can be used as a method to further reduce water usage. With water rationing, the local water utility specifies a per capita amount of water that is allowed for use at the current billing rate. If this amount is exceeded, a surcharge is issued for water used above the allotted amount. This method is implemented if voluntary and mandatory restrictions are unable to reduce demands sufficiently or if water availability declines further.

The surcharge applied to water use above the allotment is significant. Because the surcharge is very high, it is a strong deterrent against exceeding the allotment value. Again, a strong public education program is required along with implementation of water rationing.

Water rationing is an unpopular alternative for both localities and consumers. It places extreme restrictions on consumer water use and provides a very strong negative incentive for maintaining water usage below the allotted level. The program is not likely to be supported by the consumer

because of the high fees incurred for exceeding water limits. However, the program is usually successful at reducing demands if ordinances are in place to enforce the goals.

13.11 Outdoor Water Use Conservation Measures

Landscape irrigation and outdoor water uses are responsible for the increased water use trends in the summer months. The average water use during the winter months is equivalent to 156 gpd/ERC while the average summer water use is equivalent to 231 gpd/ERC. The water system serves up-market subdivisions that typically have large landscaped lots, and a significant proportion of residences have in-ground irrigation systems.

To support the beneficial needs of the communities while conserving water, the water conservation measures described in the previous sections, including water saving devices, water loss reduction, conservation through customer education, billing schedule incentives, and water restriction measures may help minimize water use for irrigation and other outdoor uses.

Modifying the outdoor water use habits of the residents are most likely modified through education. Aqua's approach to educating customers shall include the following:

- Provide information to the home owners associations for inclusion in flyers provided to the residents;
- Provide water conversation tips and information on best irrigation practices to be included with the customers' bills annually.

The customers shall be provided with information specific to managing residential irrigation systems and swimming pools, including the following water saving tips provided by Aqua's water-smart website (<https://www.aquaamerica.com/water-smart/conservation.aspx>):

- Water your lawn only when it needs it. Simply walk across the grass to see if it needs water. If you leave footprints, it's time to water.
- Water in the early morning. Nearly 30 percent of water can evaporate when watering at midday. Don't water your lawn on windy days.
- Deep soak your lawn instead of frequent sprinklings that evaporate quickly.
- Set your lawn mower one notch higher to limit evaporation.
- Check sprinkler heads and valves for leaks and adjust the timer according to seasonal water needs and weather conditions.
- Plant for your climate. Native and drought-tolerant plants might have lower water needs. A local nursery can help you plan a water-wise garden.
- Use mulch around plants and shrubs to save moisture.
- When using a hose, control the flow with an automatic shut-off nozzle.
- Use a broom, instead of a hose, to clean sidewalks and driveways.
- When washing your car, use soap and water from a bucket, along with a sponge and hose with a shut-off valve.

- Disconnect hoses and make sure outdoor water is shut off during cold weather to prevent leaks.
- If you have a swimming pool, get a cover. You'll cut the loss of water by evaporation by 90 percent.
- Eliminate shrub bed irrigation for established landscaping.
- Maintain automated irrigation systems controls to limit overwatering.
- Repair significant leaks quickly to minimize the loss of water.

Educational materials shall also include information on water saving devices suitable for irrigation systems, including:

- Converting the irrigation system controllers to weather based controllers, including rain sensors; and
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As discussed in Section 13.6, the impacts from increasing water rates may have an effect on water conservation in these subdivisions. Billing rate changes were implemented in 2012. The water rates were increased from \$0.0054/gallon to \$0.00704/gallon, and billed at a flat base rate for every gallon used. The effectiveness of the rate increase on reducing water use are likely to be felt over time, and any changes attributed to the recent rate increases will be monitored.

Modifying water use habits without significant water rate increases is not expected. If water use projections are observed for the water system that may exceed the permitted amount, a tiered rate structure may be used to reduce excessive water use. As the water system rates are regulated by the Virginia SCC, modifying the rates in a timely manner is unlikely. In addition, the impacts of a tiered rate structure on water use are not known. Alternatively, voluntary use restrictions may be employed to limit water use. Voluntary constraints may limit nonessential water uses, such as outdoor water uses, (e.g., car washing and lawn watering). Acceptance of voluntary restrictions would be improved through conservation education described above. Voluntary conservation methods could include odd-even watering, limiting the hours during the day that irrigation is allowed, or time restrictions placed on outdoor irrigation.



COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Quarter 1 2 3 4
Page ____ of ____

Quarterly Ground Water Withdrawal Report

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Water System**
Owner **Aqua Virginia, Inc.**
Address **2414 Granite Ridge Rd.
Rockville, VA 23146**
County/City **King William County**

Name of Operator _____
Position/Title _____
Signature _____
Date _____ Phone _____
Permit #GW0002001
(New Permit Application Due – June 5, 2023)

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NAME: _____ DATE: _____

SIGNATURE: _____